Improved Geometry Interpolation in DSM2- Hydro

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Background

- Governing equations are solved using the four-point-implicit method (FourPt, USGS 1997)
- A simple example of a single channel divided into three computational reaches (USGS 1997):

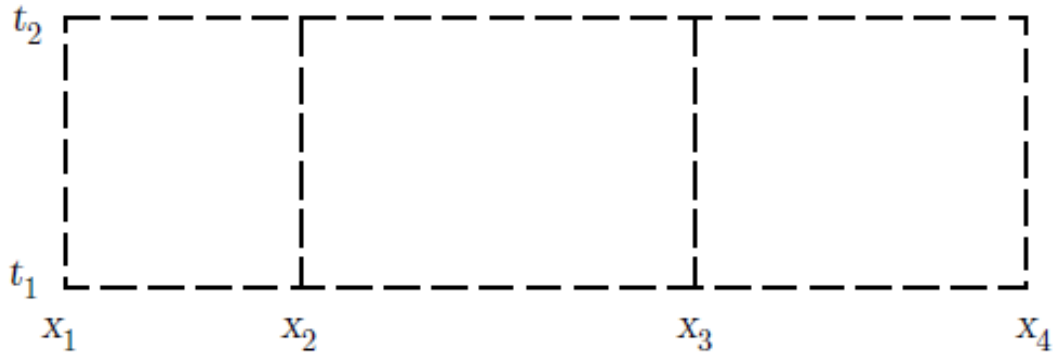
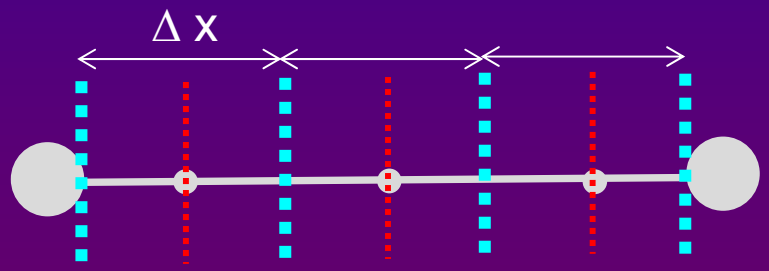


Figure 1: Computational grid.

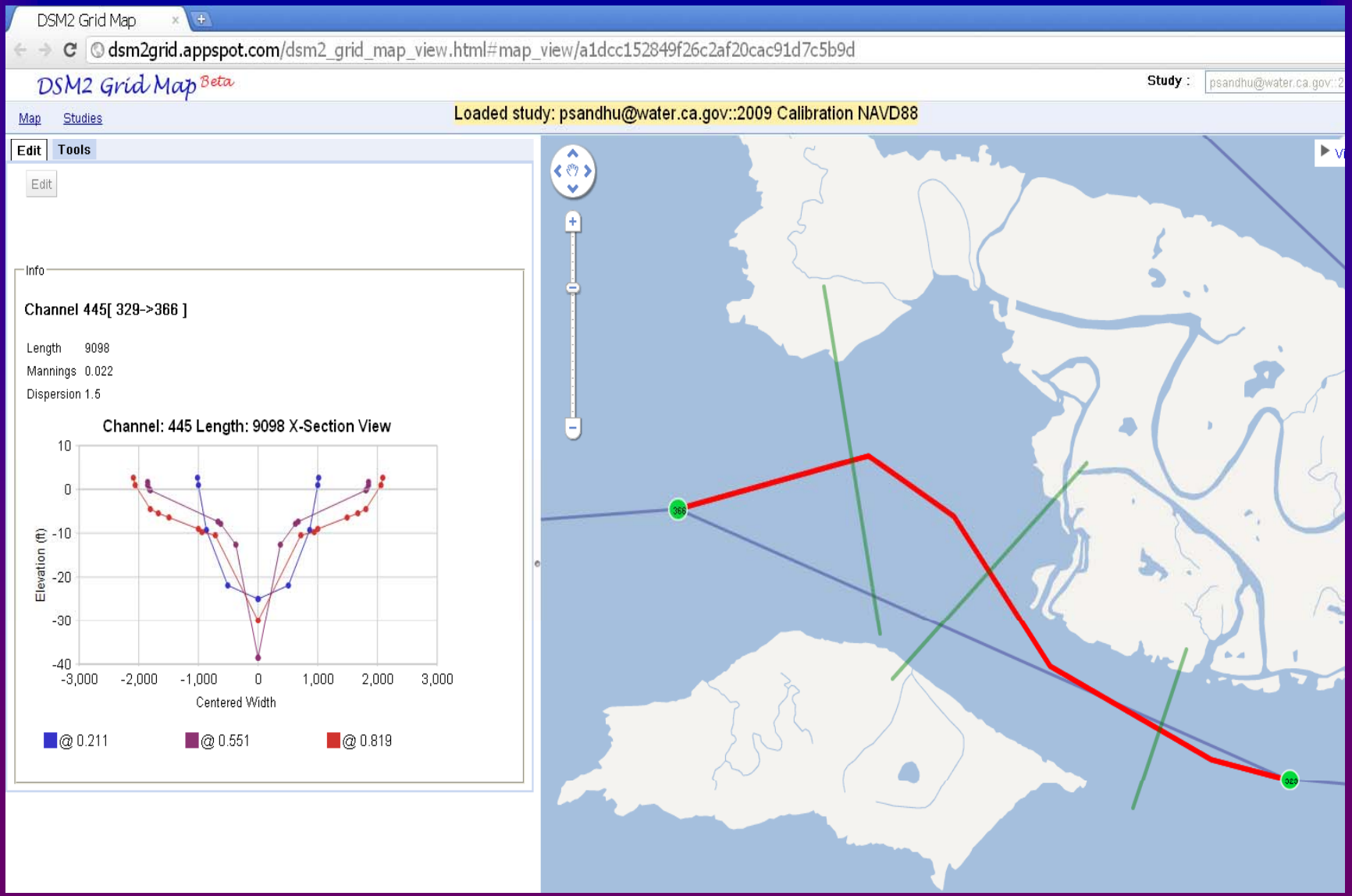
Discretization in Hydro

- Geometry interpolated to computational points and center points (i.e. virtual cross sections) from user input cross sections.
  - User specifies spatial grid ΔX (5000 ft)
  - Actual ΔX for each channel depends on the channel length: smallest subdivision ≥ requested

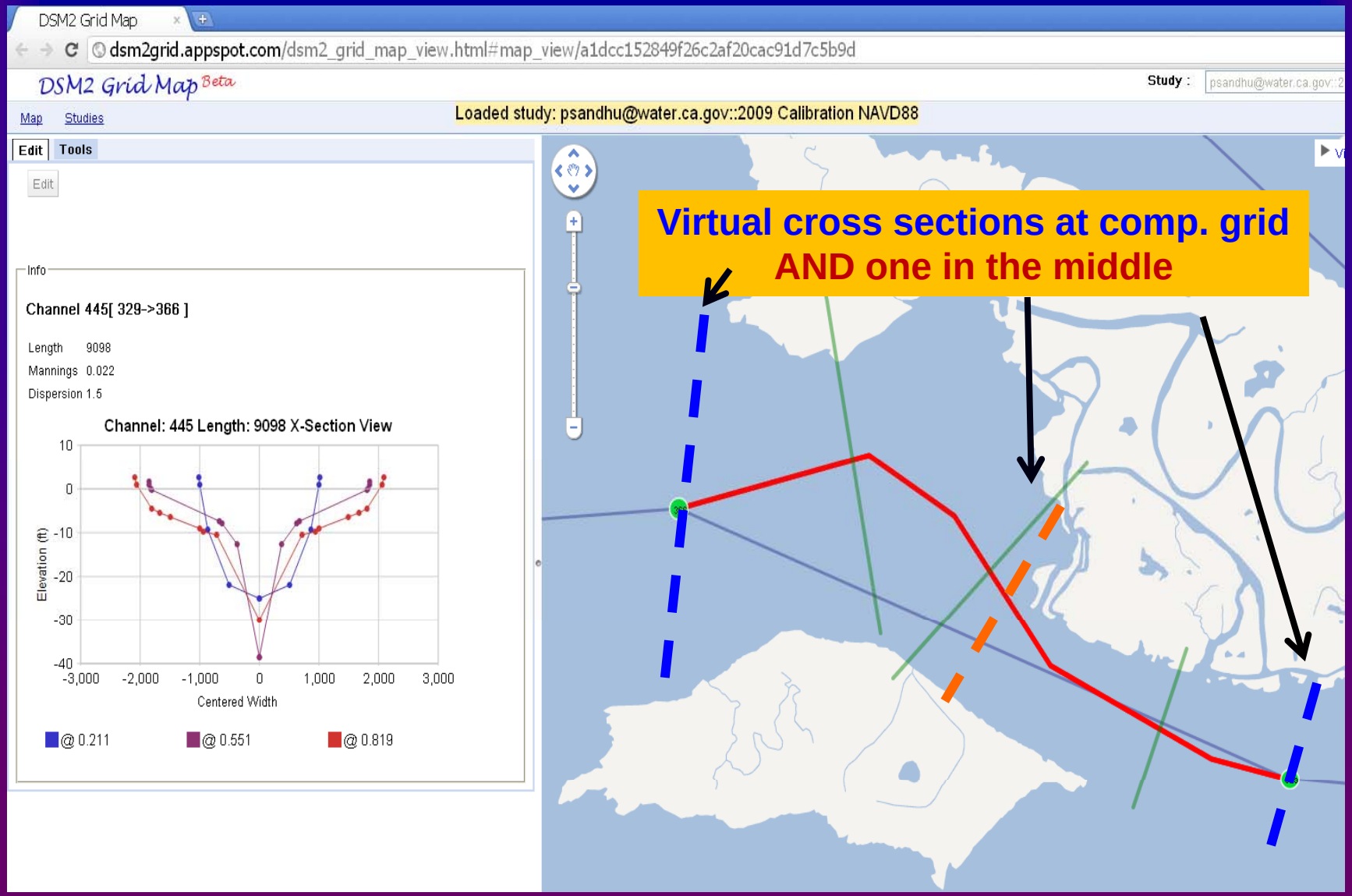


Virtual Cross Sections

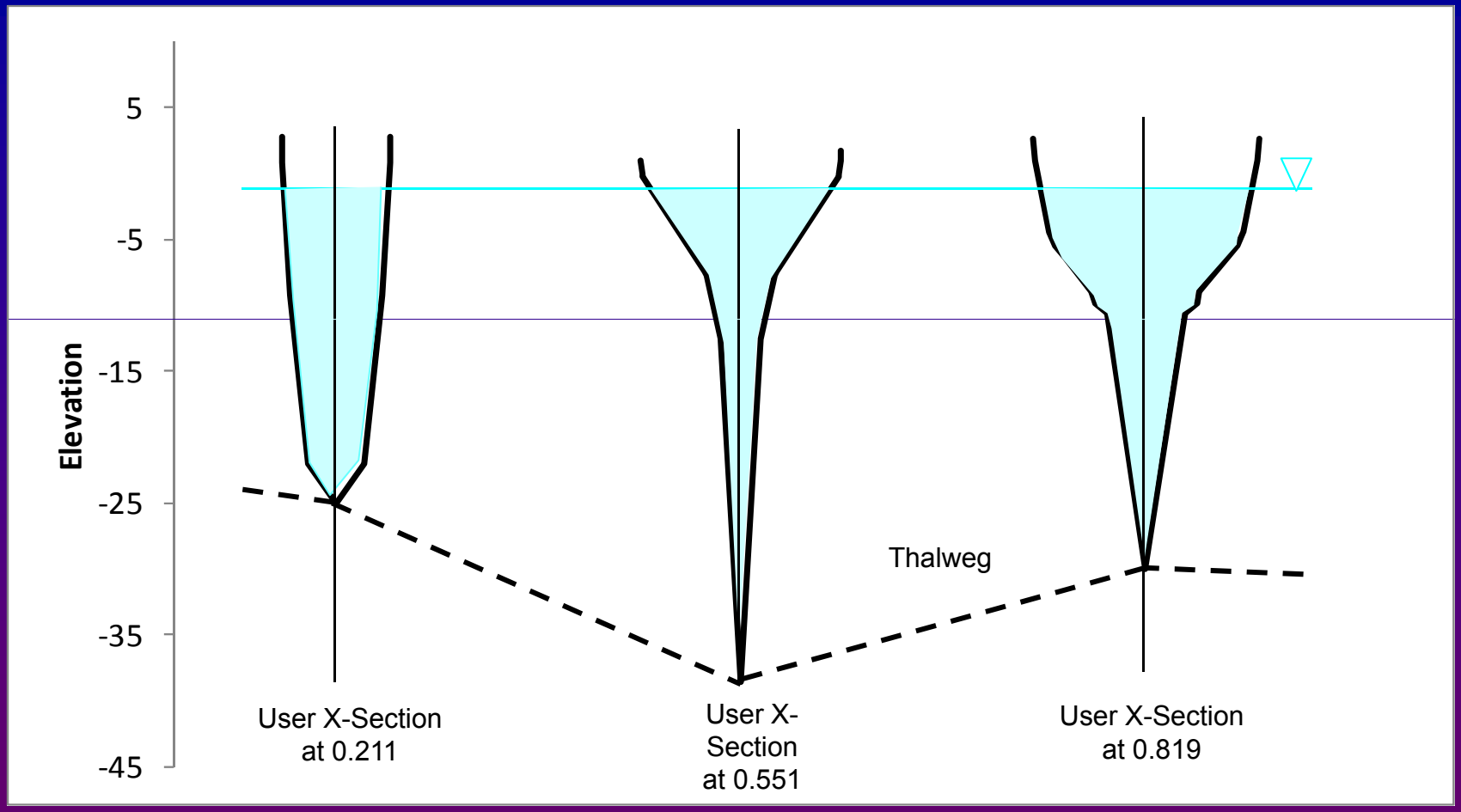
User Cross Sections



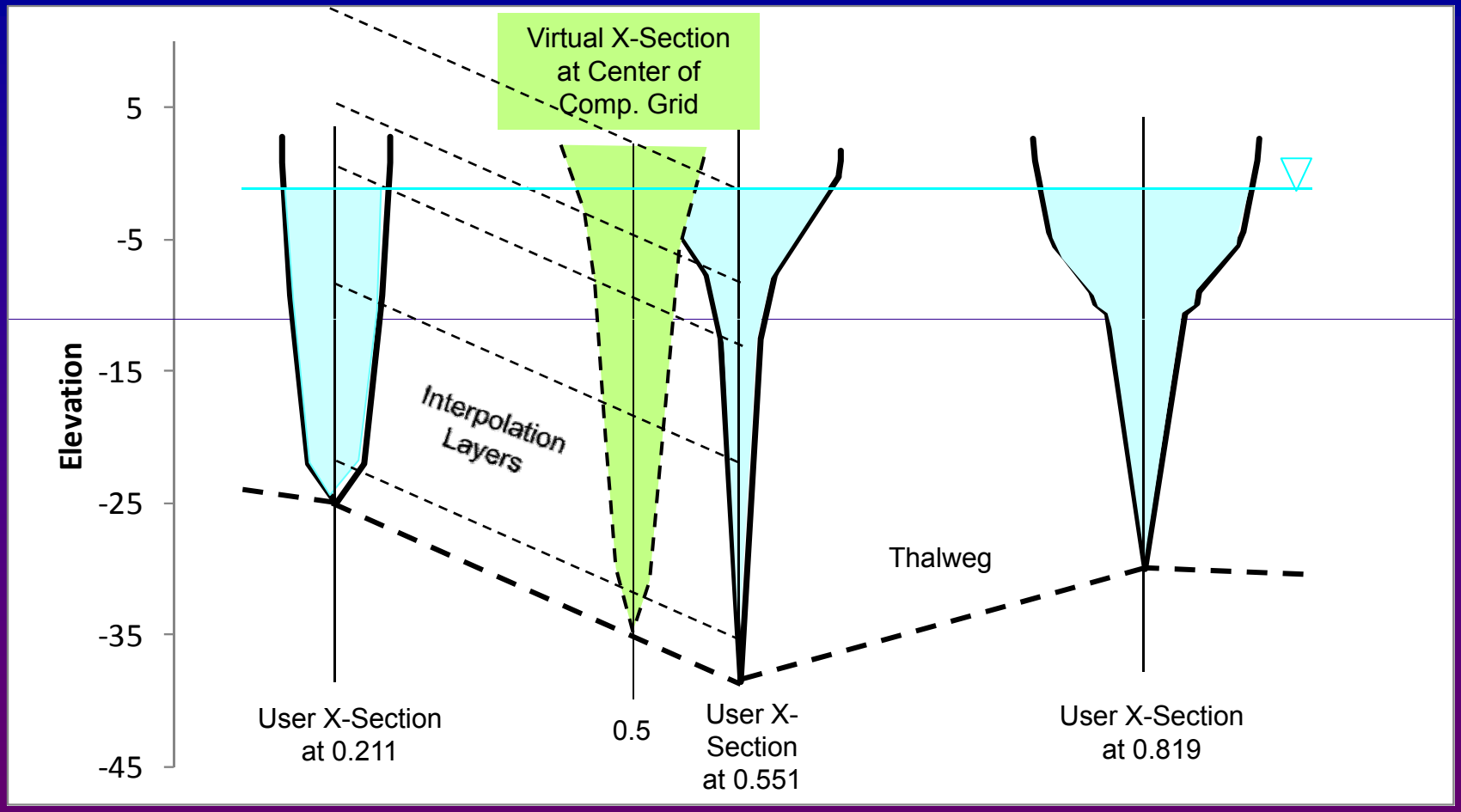
Computational Grid & Virtual Cross Sections



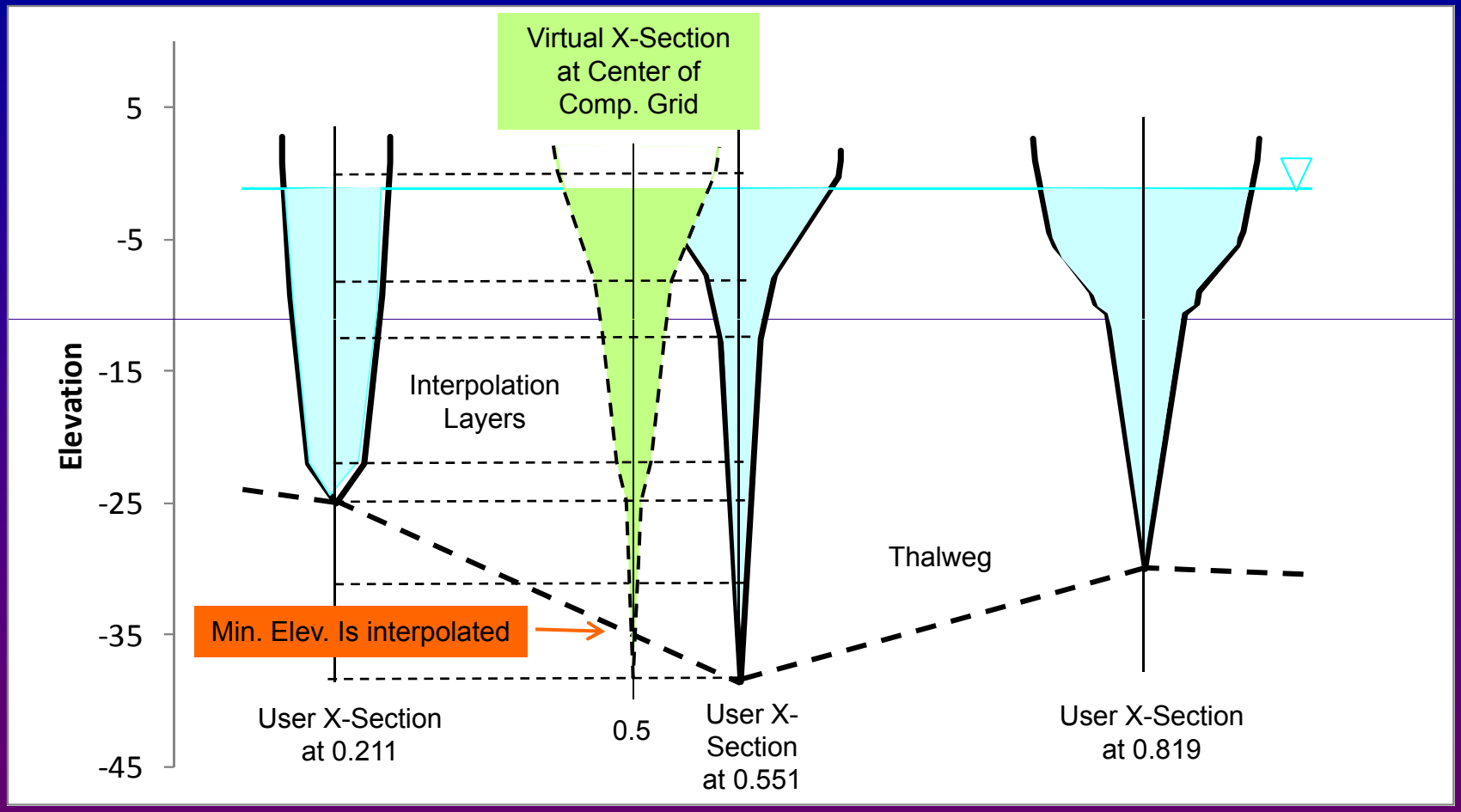
User Input Cross Sections



Height Based Interpolation



Elevation Based Interpolation

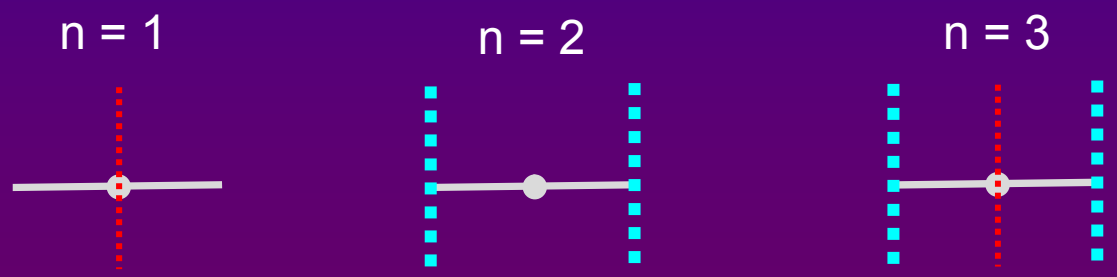


Spatial Integration

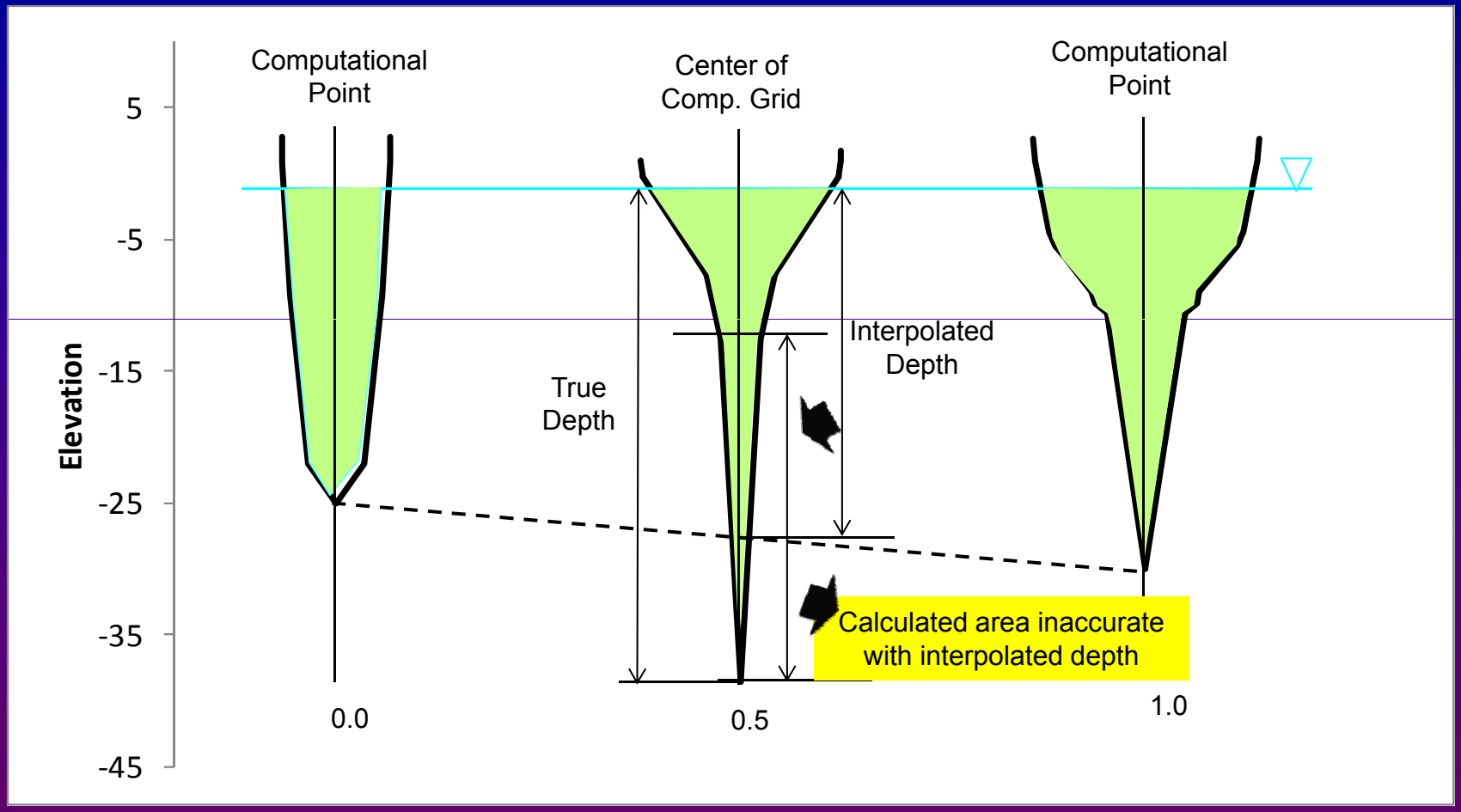
Numerical integration in space (along a computational reach):

$$\int_{x1}^{x2} \varphi \, dx \cong \Delta x \sum_{k=1}^{n} \omega_k \, \varphi_{\xi_k}$$

DSM2-Hydro has been using n = 1. Results should be more accurate using n = 3.



A Bug in Area Calculation



Summary of modifications

- Virtual cross sections are generated based on elevation.
- Interpolate water surface instead of depth for midpoint geometry calculation.
- Results should be more accurate using n = 3 .
- Calibration will be needed for both Hydro and Qual.

Thank you!

Questions

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